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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/782,979	02/23/2004	Shiro Suyama	32307-201092	2620
26694	7590	01/23/2006	EXAMINER	
VENABLE LLP			SHENG, TOM V	
P.O. BOX 34385			ART UNIT	
WASHINGTON, DC 20045-9998			PAPER NUMBER	
			2677	
DATE MAILED: 01/23/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/782,979	SUYAMA ET AL.	
	Examiner	Art Unit	
	Tom V. Sheng	2677	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 44-61 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 44-61 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☒ Certified copies of the priority documents have been received in Application No. 08/784,353.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>2/23/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 44 and 49 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure, which is not enabling. The feature regarding a series of depth direction sampled two-dimensional images as a virtual or phantom three-dimensional image, critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976).

Referring to at least fig. 40 and page 88, line 23 through page 89, line 5 of the specification, the applicants disclose the criticality of the way the phantom three-dimensional image is generated in order for a three-dimensional display to occur. Specifically, applicants teach, "Eyes of the observer 66 represents a view position of the observer 66. The two-dimensional image 67 represents an image to be displayed on the two-dimensional display device 61, which is generated by decomposing the three-dimensional image into the two-dimensional image represented on a plane at predetermined intervals according to procedures described later. Namely, the two-dimensional image 67 are a depth sampled image." The success of applicants' three-

Art Unit: 2677

dimensional display depends on the synchronized coordination between the depth direction sampled two-dimensional images and a variable focal lens 62.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

4. Claims 44, 45, 46, 49 and 54 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As for claims 44 and 49, it is unclear as to the meanings of "phantom three-dimensional display device", line 1 and "phantom three-dimensional image", lines 1-2, to allow one of ordinary skill in the art to utilize the invention. These features are critical to the invention and need to be defined clearly in the claims.

As for claim 45, it is unclear as to the meaning of "two-dimensionally divided", line 2, to allow one of ordinary skill in the art to utilize the invention. Does applicant mean that the shutter element is a series of two-dimensional regions divided along another dimension?

Claim 45 recites the limitation "divided regions" in line 2. There is insufficient antecedent basis for this limitation in the claim.

As for claim 46, it is unclear as to the meaning "said shutter element lowers a light transmittance in the region of depth sampling images", lines 1-2. What is depth sampling?

Art Unit: 2677

As for claim 49, it is unclear as to the meaning "said phantom three-dimensional image being a real image", line 5. What does the applicant really mean? A real image usually means an image of an object directly observed. Also, it is unclear as to the meaning of "lowering a light transmittance in a real image region at the position of said shutter element", lines 6-7. In particular, please explain with regard to "a real image region at the position of said shutter element." Please provide details on specification and figures.

Claim 54 recites the limitation "the fixed deflection mechanism" in line 3. There is insufficient antecedent basis for this limitation in the claim.

The below rejections are based on best understandings of the examiner in view of above 35 U.S.C. 112 rejections.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 44-46 are rejected under 35 U.S.C. 102(e) as being anticipated by Greening et al. (US 5,828,487).

As for claim 44, Greening teaches a three-dimensional display device (stereoscopic viewing system; fig. 2) comprising:

a phantom three-dimensional display device (endoscope 10) for displaying a phantom three-dimensional image (substantially converged image of object 16 through exit lens 14; column 4, lines 44-55); and

a shutter device (switching device 26) formed by a shutter element (opaque leaf 30) for controlling a light transmittance (to blank off specific image path; column 4, line 56 through column 5, line 8),

said shutter device (switching device 26) being located at a position where said phantom three-dimensional image is reproduced or a position optically equivalent to said position (located substantially at the converged or focal point of light out of exit lens 14). See also column 5, lines 9-21 on operation of the stereoscopic viewing system.

As for claim 45, the opaque leaf 30 corresponds to claimed two-dimensionally divided region, as best understood by the examiner.

As for claim 46, the synchronized blanking of left and right perspectives with viewing of the left and right eyes correspond to claimed sampling and viewing during a time duration.

7. Claims 49-50 are rejected under 35 U.S.C. 102(e) as being anticipated by Ito et al. (US 5,583,677).

As for claim 49, Ito teaches a three-dimensional display device comprising:

a phantom three-dimensional display device (liquid crystal display; fig. 3) for

Art Unit: 2677

displaying a phantom three-dimensional image (inherently image generated by modulating an incoming light, whether incident normally or obliquely); and

a shutter device formed by a shutter element (an optically anisotropic element RF with an optic axis at an angle with respect to the normal line of the liquid crystal cell LC; column 3, line 51 through column 4, line 2) for controlling a light transmittance (element RF is an photoisomerizable substance of which photochromic compound is a well known example; column 4, lines 34-58),

said phantom three-dimensional image being a real image (image produced by element LC), and said shutter element being a photoreactive element (photochromic compound is photoreactive) for lowering a light transmittance (inherently, as light strikes, the molecule being stroke darkens in response) in a real image region at the position of said shutter element (where element RF is located) in accordance with an imaging light beam of said real image.

As for claim 50, Ito's optically anisotropic element RF is made of photochromic material.

Claim Rejections - 35 USC § 103

8. Claims 47-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Greening as applied to claim 44 above, and further in view of Takahara et al. (US RE37,219 E) and Toda et al. (US 5,047,847).

As for claim 47, Greening's shutter element is an opaque leaf and blanking of a specific path is by moving laterally over to block (column 5, lines 22-27). Greening does not teach using a liquid crystal as the shutter element.

Takahara teaches the existence of two types of polymer dispersed liquid crystal display panels. One particular type is called a small ratio type (fig. 1a and 1b) and corresponds to claimed "polymer dispersion type liquid crystal containing droplet-like liquid crystal in polymer." By applying a voltage to the liquid crystal 136, the liquid crystal molecules in the droplets 141 will align, thus allowing light to transmit instead of scattered. For details, see column 1, line 55 through column 2, line 22. One of ordinary skill in the art would recognize that the liquid crystal panel could work as a shutter simply by varying between a zero potential and a sufficiently high potential to completely align the LC molecules.

Therefore, it would have been obvious to apply a liquid crystal panel of Takahara in place of Greening mechanical shutter mechanism, since electro-optical control is more reliable than electro-mechanical control to one of ordinary skill in the art.

As additional support, the use of liquid crystal as a shutter/iris is taught by Toda, where a liquid crystal iris (LC Iris 47; fig. 4 and 5) is controlled by voltages applied across (column 5, line 7 through column 6, line 2).

As for claim 48, Greening's endoscope 10 is a two-dimensional optical lens system but does not utilize a varifocal optical device. Toda teaches a LC lens 45 that varies its refractive index with respect to driving voltages. Naturally, the focal length is correspondingly affected because focal length of a lens depends on the refractive index

Art Unit: 2677

of the lens (fig. 7; column 8, lines 34-44). One of ordinary skill in the art would recognize that Toda's LC lens 45 is a lightweight alternative to Greening's optical lens assembly, as focal length can be set easily with a specific voltage value.

Therefore, it would have been obvious for one of ordinary skill in the art to incorporate Toda's LC lens 45 in place of Greening's optical lens assembly of endoscope 10, resulting in less weight and easier control.

9. Claims 52 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo (US 5,880,883).

As for claim 52, Sudo teaches a head-mount display device (fig. 43) comprising: two display devices corresponding to left and right eyes (image display 1 and optical system 30 on each side; column 24, lines 27-64) and each including a two-dimensional display device (image display 1 displays an inherently two-dimensional image) and an optical device (optical system 30).

Sudo further teaches a control device for controlling said two dimensional display device (image signal generating portion 2 and magnification modulator 7) and said optical device (the lens 3R' with variable focal length inherently is controlled by a control device), said display devices being mounted to left and right eyes (as shown), and said control device synchronously driving said two-dimensional display device and said optical device to perform three-dimensional display (stereoscopic display due to both parallax and size difference of left and right images; column 25, lines 1-16. Inherently,

Art Unit: 2677

the lens and the display on each side work in sync to produce the stereoscopic display.).

Sudo does not teach that the left lens 3L also has a variable focal length. On the other hand, one of ordinary skill in the art would recognize that first that lens 3L has fixed focal length because parallax and size adjustment is only necessary on one side and second that if both lenses are made with variable focal length the function is still equivalent. The only possible advantage would be that the range of focal lengths might be made smaller. Therefore, it would have been obvious to provide variable focal length on both lenses, because of the functional equivalence.

As for claim 53, Sudo teaches the use of two mirrors 6L and 6R for converging the left and right images at a centerline. Naturally, as the focal lengths of the right lens 3R and/or left lens 3L change, the perceived image would also move along the centerline.

10. Claims 54, 55 and 58-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo as applied to claim 52 above, and further in view of Sakata (US 5,299,037).

As for claim 54, Sudo's optical device with variable focal length is achieved by a zoom lens mechanism. Sudo does not teach the optical device is formed of a transparent material with a fixed shape/mechanism, a layer of variable refractive index material, and a pair of transparent electrodes sandwiching the layer.

Sakata teaches a display element (fig. 1-3) comprising material 1 that corresponds to claimed transparent material, material 2 that corresponds to claimed variable refractive index material, and a pair of transparent electrodes 3 that correspond to claimed transparent electrodes. As voltage across the electrodes changes, the refractive index changes resulting in a corresponding change of focal length (column 3, line 40 through column 4, line 22). Since both Sakata's variable focal length device and Sudo's are functionally equivalent, one is an obvious alternative to the other. Moreover, Sakata's optical device is naturally lighter than Sudo's, thus, it would have been obvious to substitute Sudo's optical device with Sakata's optical device for weight saving since the display is to be worn on the head.

As for claim 55, Sakata's optically anisotropic liquid crystal material is inherently both dielectric constant anisotropic and refractive index anisotropic.

As for claims 58 and 59, Sakata's material 1 could be considered a Fresnel lens or a plurality of fine prisms.

As for claim 60, naturally as the perceived image moves along the centerline, the angle is increasing or decreasing in reference to the mirrors 6.

11. Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo and Sakata as applied to claim 54 above, and further in view of Takahara et al. (US RE37,219 E).

As for claim 57, Sudo and Sakata do not teach of the variable refractive index material being a polymer dispersed liquid crystal.

Takahara teaches the existence of two types of polymer dispersed liquid crystal display panels. One particular type is called a small ratio type (fig. 1a and 1b) and corresponds to claimed "polymer dispersion type liquid crystal containing droplet-like liquid crystal in polymer." By applying a voltage to the liquid crystal 136, the liquid crystal molecules in the droplets 141 will align, thus allowing light to transmit instead of scattered. For details, see column 1, line 55 through column 2, line 22. One of ordinary skill in the art would recognize that the liquid crystal panel could work to control refractive index simply by varying between a zero potential and a sufficiently high potential to completely align the LC molecules.

Therefore, it would have been obvious to apply a liquid crystal type of Takahara in Sakata's refractive index anisotropic material, since an equivalent alternative.

Allowable Subject Matter

12. Claims 56 and 61 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

13. The following is a statement of reasons for the indication of allowable subject matter: none of the prior arts of record teaches the limitations "wherein said variable refractive index material is liquid crystal having dielectric constant anisotropy and refractive index anisotropy, and being dual-frequency liquid crystal having a different physical property having a different sign of a difference in a dielectric constant corresponding to orientation of the liquid crystal molecules between different

Art Unit: 2677

frequencies f1 and f2" of claim 56 and "wherein said driving device sequentially applies voltages V1 to VN having primary frequencies f1 to fN ($N \geq 2$) to said transparent electrodes for a predetermined period of time and at a predetermined interval" of claim 61.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tom V. Sheng whose telephone number is (571) 272-7684. The examiner can normally be reached on 9:00am - 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amr Awad can be reached on (571) 272-7764. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tom Sheng
January 12, 2006

AMR A. AWAD
PRIMARY EXAMINER
